Original Research
Pediatric Dentistry

Factors for determining dental anxiety in preschool children with severe dental caries

Jenny ABANTO[a]
Evelyn Alvarez VIDIGAL[a]
Thiago Saads CARVALHO[b]
Stella Núbia Coelho de SÁ[a]
Marcelo BÖNECKER[a]

[a]Universidade de São Paulo – USP, Faculty of Dentistry, Department of Pediatric Dentistry and Orthodontics, São Paulo, SP, Brazil.

[b]University of Bern, Department of Preventive, Restorative and Pediatric Dentistry, Bern, Switzerland.

Declaration of Interests: The authors certify that they have no commercial or associative interest that represents a conflict of interest in connection with the manuscript.

Corresponding Author:
Jenny Abanto
E-mail: jennyaa@usp.br

DOI: 10.1590/1807-3107BOR-2017.vol31.0013

Submitted: Aug 7, 2015
Accepted for publication: Nov 21, 2016
Last revision: Dec 6, 2016

Abstract: The aim of this study was to assess the clinical and socioeconomic indicators associated with dental anxiety in preschool children with severe dental caries. A total of 100 children between 3 and 5 years of age were selected during a dental screening procedure. The selection criteria were having at least one tooth with dental caries and a visible pulpal involvement, ulceration, fistula, and abscess (PUFA) index of ≥1 in primary teeth. Before the clinical examination or any treatment procedure was performed, we evaluated the children's dental anxiety using the Facial Image Scale (FIS). Parents completed a questionnaire on socioeconomic conditions, which included the family structure, number of siblings, parental level of education, and family income. A dentist blinded to FIS and socioeconomic data performed the clinical examination. Poisson regressions associate clinical and socioeconomic conditions with the outcome. Most of the children (53%) experienced extensive dental caries (dmf-t ≥ 6), and all children had severe caries lesions, with a PUFA index of ≥1 in 41% and that of ≥2 in 59%. The multivariate adjusted model showed that older children (4–5-year old) experienced lower dental anxiety levels compared with younger children (3-year old) (RR = 0.35; 95%CI: 0.17–0.72 and RR = 0.18; 95%CI: 0.04–0.76, respectively), and children with three or more siblings were associated with higher levels of dental anxiety (RR = 2.27; 95%CI: 1.06–4.87). Older age is associated with low dental anxiety, and more number of siblings is associated with high dental anxiety in preschool children, whereas the severity or extent of dental caries is not associated with dental anxiety.

Keywords: Dental Caries; Dental Anxiety; Child, Preschool; Behavior Symptoms.

Introduction

Dental anxiety is a common problem that pediatric dental practitioners encounter daily. It can affect patient management and dental attendance[1] and can persist even in adulthood, leading to dental avoidance.[2]

There is currently no singular explanation for the development of dental anxiety in children, and its etiology is still not entirely understood. The nature of this particular kind of anxiety could be related to diverse factors such as the age of children, their sociocultural background, or their

parents' dental experiences.[3,4] However, there is some support for the argument that the modeling pathway could be important in the development of children's dental anxiety.[5,6]

It has been suggested that children who have had previous dental experiences could have higher levels of dental anxiety.[7,8] However, the evidence remains insufficient. A recent study observed that dental anxiety in children is more directly related to dental caries,[9] but there are no studies that investigate the association between the severity of caries and high levels of dental anxiety. To date, the association between anxiety and dental caries has not been tested in preschool children with severe dental caries.

Moreover, the abovementioned studies mostly concentrate on children aged ≥5 years, with only one study evaluating dental anxiety in children aged <5 years.[10] Most of these studies have been conducted in developed countries.[7,8] However, there have been a few studies in developing countries,[9,11] which could affect the results owing to the cultural differences between developing and developed countries. To the best of our knowledge, there are no studies assessing indicators associated with dental anxiety in preschool children with dental caries using self-reports.

Thus, given the lacking and conflicting information regarding the nature of children's dental anxiety, the purpose of this study was to assess the clinical and socioeconomic indicators associated with dental anxiety in preschool children with severe dental caries.

Methodology

This study was approved by the Human Research Ethics Committee of the Dental School of the University of São Paulo (500.61) in compliance with Brazilian National Health Council Resolution 466/12. All parents received information regarding the objectives of the study and provided written informed consent regarding their child's participation.

Study population and data collection

This study is part of a randomized clinical trial (ClinicalTrials.gov Identifier NCT01858298) that assessed OHRQoL in preschool children who were later subjected to two types of treatments for severe dental caries: pulpectomy and tooth extraction (Abanto et al., unpublished results). Thus, the study included children aged 3–5 years because at this age teeth are younger and have not yet begun the root resorption process. Here all anxiety assessments were performed at baseline, *i.e.*, before the children were subjected to any clinical examination or treatment. For the randomized clinical trial, sample size was calculated to give a standard error of 5% with a 95% confidence interval (CI). The prevalence of dental anxiety in children aged 4–5 years was set at 28.9%[11], and the minimum sample size was estimated to be 100 children. Therefore, the number of children included in this study was 100.

The sample comprised 100 children who sought dental treatment in the Pediatric Dentistry Department of the Dental School at the University of São Paulo (USP), Brazil. The children were aged 3–5 years and selected during a dental screening procedure at USP. The selection criteria were having at least one tooth with dental caries and a PUFA index of ≥1 in primary teeth. Children with systemic and/or neurological diseases or who had undergone dental treatment in the last 3 months as well as siblings were excluded.

On the day of their first dental appointment, the children first underwent a dental anxiety assessment. A previously trained interviewer (blinded to any oral data) assessed the children's dental anxiety before the clinical intervention/examination. The interviewer also gathered data on the socioeconomic conditions of the family, such as family structure (if the children were living with both parents or not), number of siblings (none, one, two, or ≥three), parental level of education (≤8 years or >8 years), and family income. Family income was categorized using the Brazilian minimum wage, which corresponds to approximately 340 US dollars per month. Information concerning the child's previous visits to the dentist was also collected.

After the interview, a trained and calibrated examiner conducted the children's oral examinations. Dental caries experience was assessed in primary teeth, and we used the dmf-t criteria, classifying teeth as decayed, missing, or filled.[12] We used the PUFA index for classification of disease severity.[13] The examiner had been previously trained through a process conducted in two stages. The first stage

comprised theoretical discussion with an expert in pediatric dentistry, and in the second stage, the examiner underwent two sessions of calibration, during which the examiner assessed 20 children who received dental treatment at the university clinic. The examinations of these 20 children were repeated at an interval of 1 week between the sessions. These examinations were used to obtain intraexaminer reliability kappa values, and the children who participated in the training process did not take part in the study. Cohen's kappa intraexaminer agreement values were 0.98 for dmf-t and 1.0 for PUFA.

Children's dental anxiety

The Facial Image Scale (FIS)[14] was used to evaluate the children's dental anxiety according to self-reports. This scale comprises a row of five faces, ranging from "very happy" to "very unhappy." All the faces are scored by giving a value of 1 to the happiest face and 5 to the saddest face. The interviewer asked each child to point at the face they felt most like at that moment. The scores were recorded and later categorized for analysis: 0 = no anxiety (FIS score 1), 1 = low or moderate anxiety (FIS scores 2 and 3), and 2 = high or very high anxiety (FIS scores 4 and 5). All interviews were conducted outside the dental setting (before the child was taken to the dental office)[14].

Children's oral examination

The oral examinations were performed in a dental unit using an operating light, plane dental mirrors, ball-ended WHO probes, and a three-in-one syringe for drying the teeth. The total dmf-t[12] score was then calculated, and the patients were then categorized according to caries experience based on the previously proposed scores[15,16,17,18]: dmf-t = 1–5 (low) and dmf-t ≥ 6 (high).

The PUFA index[13] was used to assess the presence of oral conditions resulting from untreated dental caries. Like the dmf-t index, each tooth was given a visible pulpal involvement, ulceration, fistula, and abscess (PUFA) index, according to caries severity.[13] The total PUFA index per patient was then calculated in the similar cumulative way as the dmf-t index and represented the number of teeth that meet the PUFA diagnostic criteria. To simplify the statistical analyses, caries severity for each child was then categorized according to the child's total PUFA index: 1 (total PUFA index = 1), 2 (total PUFA index = 2), and 3 (total PUFA index ≥ 3).

Data analysis

Data analyses were performed using IBM SPSS software, version 22 (IBM Corp., Armonk, NY, USA). Poisson regression with robust variance was performed to associate dental anxiety scores with dental caries experience, PUFA, and socioeconomic conditions. The extent of caries experience and PUFA were considered to be continuous variables in the statistical analysis. Univariate Poisson regression analysis was performed to select variables with a p-value of ≤0.20 to enter the model. Then, explanatory variables selected were tested in the multivariate adjusted model and retained only if they had a p-value of ≤0.05. In this analysis, the outcome was employed as a count outcome, and rate ratios (RRs) and 95% CIs were calculated. Caries experience and PUFA index variables were retained in the final model as control variables.

Results

Of the 107 eligible participants, 100 provided informed consent (positive RR = 93.5%). Table 1 shows the socioeconomic and clinical conditions of the sample. Overall, 53% of the children had high dental caries experience (dmf-t ≥ 6) and 48% had a PUFA index score of 2. A total of 39% of the children had little or some anxiety (FIS score 2 or 3). Most of the preschool children lived with both parents (89%) and 49% had no siblings. A majority of the children had no previous visits to the dentist (82%) (Table 1).

Table 2 shows the univariate unadjusted analysis of clinical and socioeconomic conditions variables associated with dental anxiety scores. Dental anxiety scores were significantly associated with the child's age ($p < 0.05$). The multivariate adjusted model (Table 2) showed that older children (aged 4–5 years) experienced lower dental anxiety levels than younger children (aged 3 years) (RR = 0.35; 95%CI: 0.17–0.72 and RR = 0.18; 95%CI: 0.04–0.76, respectively). Also, children from larger families, with three or more siblings, had higher dental anxiety levels (RR = 2.27;

Table 1. General sociodemografic and clinical characteristics of the sample (n = 100).

Variable	N (%)
dmf-t	
dmf-t score (Mean ± SD)	6.49 ± 3.34
Extent of caries experience	
Low caries experience (dmf-t = 1–5)	47 (47)
High caries experience (dmf-t ≥ 6)	53 (53)
PUFA score	
1	41 (41)
2	48 (48)
3 or higher	11 (11)
Anxiety levels	
No anxiety	34 (34)
Little or some anxiety (FIS scores 2 and 3)	39 (39)
High or very high anxiety (FIS scores 4 and 5)	27 (27)
Sex	
Female	55 (55)
Male	45 (45)
Age (years)	
3	46 (46)
4	42 (42)
5	12 (12)
Responsible person	
Mother	81 (81)
Father	19 (19)
Lives with	
Both parents	89 (89)
Only mother	11 (11)
Siblings	
No siblings	49 (49)
1 or 2 siblings	38 (38)
3 or more siblings	13 (13)
Mother's schooling	
≤8 years	51 (51)
>8 years	49 (49)
Father's schooling	
≤8 years	54 (54)
>8 years	46 (46)
Income	
Monthly income (Mean ± SD)	
Income (Categorical)	
Up to 3 BMW	46 (46)
From 3 to 4 BMW	32 (32)
More than 4 BMW	22 (22)
Previous visit to dentist	
No previous visit	82 (82)
Had previous visit	18 (18)

FIS: facial image scale; BMW = Brazilian minimum wage.

95%CI: 1.06–4.87). Conversely, children who had previous visits to the dentist had lower dental anxiety levels (RR = 0.38; 95%CI: 0.15–0.97).

Discussion

This study assessed the socioeconomic and clinical indicators associated with dental anxiety in preschool children with severe dental caries. To the best of our knowledge, this is the first study to assess anxiety in preschool children with dental caries aged 3–5 years using self-reports.

It has been affirmed that dental anxiety could be considered a risk factor for dental caries experience;[8] however, in our study, neither the extent of caries experience nor dental caries severity (based on PUFA index scores) in young children was associated with dental anxiety. This is in accordance with a previous cross-sectional study that found no association between dental caries and dental anxiety in older children.[19] This suggests that irrespective of whether children have more caries lesions or deeper lesions, caries experience and severity does not play a substantial role in the anxiety level of children. However, the association between lower caries severity and dental anxiety should be further investigated. Thus, future studies involving children with lower degrees of caries severity should be conducted to assess whether there is any association with dental anxiety.

Other more general factors could better explain the children's anxiety levels before dental treatment. It has been reported that dental anxiety could decrease with age.[4,20,21] Likewise, in this study, we found that 4–5-year olds experienced less dental anxiety than the 3-year olds. This could be owing to the development of cognitive abilities as well as the manner in which children learn to deal with anxious situations.[22] Older children have greater cognitive ability, a better understanding of their surroundings, and a better perception of frightful situations; hence, they are less susceptible to dental anxiety.[22] Moreover, older preschool children are better at assimilating the explanations given by their (nonanxious) parents and/or dentists, thereby reducing their dental anxiety.

Table 2. Univariate and multivariate adjusted model for association between covariates with respect to dental anxiety (FIS scores).

Covariates	Unadjusted model		Adjusted model	
	Robust RR (95%CI)	p-value*	Robust RR (95%CI)	p-value*
Oral clinical variables				
Extent of caries (cont.)	0.99 (0.90–1.01)	0.873	0.90 (0.77–1.07)	0.228
PUFA (cont.)	1.17 (0.97–1.41)	0.094	0.98 (0.70–1.37)	0.906
Socioeconomic variables				
Sex	-	-	CNS	-
Female	1	-	-	-
Male	0.79 (0.49–1.27)	0.328	-	-
Age (years)				
3	1	-	1	-
4	0.84 (0.52–1.36)	0.467	0.35 (0.17–0.72)	0.004
5	0.20 (0.05–0.84)	0.027	0.18 (0.04–0.76)	0.020
Responsible person	-	-	CNS	-
Mother	1	-	-	-
Father	1.39 (0.81–2.41)	0.235	-	-
Lives with	-	-	CNS	-
Both parents	1	-	-	-
Only mother	1.21 (0.60–2.45)	0.588	-	-
Siblings				
No siblings	1	-	1	-
1 or 2 siblings	0.97 (0.57–1.64)	0.901	1.44 (0.73–2.86)	0.299
3 or more siblings	1.53 (0.80–2.92)	0.195	2.27 (1.06–4.87)	0.036
Mother's schooling	-	-	CNS	-
≤8 years	1	-	-	-
>8 years	1.14 (0.71–1.82)	0.598	-	-
Father's schooling	-	-	CNS	-
≤8 years	1	-	-	-
>8 years	1.40 (0.86–2.29)	0.177	-	-
Income (Categorical)	-	-	CNS	-
Up to 3 BMW	1	-	-	-
From 3 to 4 BMW	0.63 (0.35–1.16)	0.142	-	-
More than 4 BMW	1.23 (0.71–2.14)	0.463	-	-
Previous visit to dentist				
No previous visit	1	-	1	-
Had previous visit	0.60 (0.29–1.25)	0.171	0.38 (0.15–0.97)	0.043

*Calculated by Wald Chi-Square test; CNS: covariate not significant; FIS: facial image scale; BMW: Brazilian minimum wage.

We observed that preschool children with three or more siblings have higher dental anxiety levels. One explanation for this could be that children from larger families could be directly or indirectly exposed to information about their siblings' dental treatments or they could observe their siblings displaying anxious behaviors during dental treatments. Thus, it could be expected that children with more siblings may be susceptible to negative thoughts, which might have an impact on their dental anxiety.[5,23] One study showed that in children with siblings, the first-born child was at increased risk of developing negative behavior and dental anxiety.[24] We did not have birth-order information for the children recruited children in this study. However, the role of the birth order could be assessed as a possible factor of behavior during dental treatment in further studies. Because children normally spend a lot of their time with their siblings, it is important to further

investigate exactly how siblings can influence young patients' dental anxiety levels.

Previous studies have shown that high levels of dental anxiety in children are strongly associated with traumatic dental settings[8] and previous negative dental experiences.[20] Therefore, we included previous visits to the dentist as a covariate in our analyses. However, contrary to expectations, previous dental visits appeared to be a significantly protective factor toward dental anxiety levels. In other words, previous visits to the dentists were associated with lower anxiety levels. Although most of the children had no previous visits to the dentist, those who had previously visited the dentist did not have higher anxiety levels.

At present, despite this topic being relatively unexplored, dental anxiety seems to be rather related to a history of dental pain in preschool children.[11] In addition, it has been observed that people who have a series of painless appointments are less likely to develop dental anxiety than those who have previously experienced pain during treatment.[25] Thus, the history of pain experienced in previous dental appointments is probably a much better predictor of dental anxiety than the simple fact of whether the child has or has not previously visited the dentist.

Despite the need for more studies to individually pinpoint the specific roles of each variable on dental anxiety levels in children, our present findings offer relevant information on the major factors associated with dental anxiety in preschool children. This could help dentists better understand children's behavior in dental settings as well as encourage clinicians to use psychological strategies to enhance trust in children with dental anxiety. However, a limitation of this study is its sample size, which does not allow for extrapolation of the results to the general population. For this reason, future studies with a representative sample size are needed. In addition, the low dental anxiety levels correlated with older age and previous dental visits could have partly resulted from the interviews being conducted in the waiting room and before the child knew his/her dental conditions. However, the FIS application protocol stipulates that the child be approached outside the examination/treatment room before the start of the examination/treatment session.

Taken together, our results provide important information for pediatric dentists to determine the most appropriate clinical management, focusing not only on minimally invasive treatments but also on procedures that cause the least possible pain to the child.

Conclusions

Older age is associated with low dental anxiety. More number of siblings is associated with dental anxiety in preschool children, whereas severity or extent of dental caries is not associated with dental anxiety.

Acknowledgements

This study was financially supported by Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP) process number 2013/10330-8.

References

1. Cohen SM, Fiske J, Newton JT. The impact of dental anxiety on daily living. Br Dent J. 2000;189(7):385-90. doi:10.1038/sj.bdj.4800777a
2. Armfield JM, Ketting M. Predictors of dental avoidance among Australian adults with different levels of dental anxiety. Health Psychol. 2015;34(9):929-40. doi:10.1037/hea0000186
3. Winer GA. A review and analysis of children's fearful behavior in dental settings. Child Dev. 1982;53(5):1111-33. doi:10.2307/1129002
4. Klingberg G, Broberg AG. Dental fear/anxiety and dental behaviour management problems in children and adolescents: a review of prevalence and concomitant psychological factors. Int J Paediatr Dent. 2007;17(6):391-406. doi:10.1111/j.1365-263X.2007.00872.x
5. Porrit J, Marshman Z, Rodd HD. Understanding children's dental anxiety and psychological approaches to its reduction. Int J Paediatr Dent. 2012;22(6):397-405. doi:10.1111/j.1365-263X.2011.01208.x
6. Locker D, Liddell A, Dempster L, Shapiro D. Age of onset of dental anxiety. J Dent Res. 1999;78(3):790-6. doi:10.1177/00220345990780031201
7. Kruger E, Thomson WW, Poulton R, Davies S, Brown RH, Silva PA. Dental caries and changes in dental anxiety IN late adolescence. Community Dent Oral Epidemiol.1998;26(5):355-9. doi:10.1111/j.1600-0528.1998.tb01973.x

8. Milsom KM, Tickle M, Humphris GM, Blinkhorn AS. The relationship between anxiety and dental treatment experience in 5-year-old children. Br Dent J. 2003;194(9):503-6. doi:10.1038/sj.bdj.4810070
9. Viswanath D, Krishna AV. Correlation between dental anxiety, Sense of Coherence (SOC) and dental caries in school children from Bangalore North: a cross-sectional study. J Indian Soc Pedod Prev Dent. 2015;33(1):15-8. doi:10.4103/0970-4388.148962
10. Oliveira MM, Colares V. The relationship between dental anxiety and dental pain in children aged 18 to 59 months: a study in Recife, Pernambuco State, Brazil. Cad Saúde Pública. 2009; 25(4):743-50. doi:10.1590/S0102-311X2009000400005
11. Rojas-Alcayaga G, Uribe L, Barahona P, Lipari A, Molina Y, Herrera A et al. Dental experience, anxiety, and oral health in low-income chilean children. J Dent Child (Chic). 2015;82(3):141-6.
12. World Health Organization - WHO. Oral health surveys: basic methods. 4th ed. Geneva: ORH/EPID, 1997.
13. Monse B, Heinrich-Weltzien R, Benzian H, Holmgren C, Palenstein Helderman W. PUFA: an index of clinical consequences of untreated dental caries. Community Dent Oral Epidemiol. 2010;38(1):77-82. doi:10.1111/j.1600-0528.2009.00514.x
14. Buchanan H, Niven N. Validation of a Facial Image Scale to assess child dental anxiety. Int J Paediatr Dent. 2002;12(1):47-52.
15. Hallett KB, O'Rourke PK. Pattern and severity of early childhood caries. Community Dent Oral Epidemiol. 2006;34(1):25-35. doi: 10.1111/j.1600-0528.2006.00246.x
16. Abanto J, Paiva SM, Raggio DP, Celiberti P, Aldrigui JM, Bönecker M. The impact of dental caries and trauma in children on family quality of life. Community Dent Oral Epidemiol. 2014;40(4):323-31. doi:10.1111/j.1600-0528.2012.00672.x
17. Abanto J, Tsakos G, Paiva SM, Carvalho TS, Raggio DP, Bönecker M. Impact of dental caries and trauma on quality of life among 5- to 6-year-old children: perceptions of parents and children. Community Dent Oral Epidemiol. 2014;42(5):385-94. doi:10.1111/cdoe.12099
18. Abanto J, Carvalho TS, Mendes FM, Wanderley MT, Bönecker M, Raggio DP. Impact of oral diseases and disorders on oral health-related quality of life of preschool children. Community Dent Oral Epidemiol. 2011;39(2):105-14. doi:10.1111/j.1600-0528.2010.00580.x
19. Taani DQ, El-Qaderi SS, Abu Alhaija ES. Dental anxiety in children and its relationship to dental caries and gingival condition. Int J Dent Hyg. 2005;3(2):83-7. doi:10.1111/j.1601-5037.2005.00127.x
20. Ten Berge M, Veerkamp JS, Hoogstraten J. The etiology of childhood dental fear: the role of dental and conditioning experiences. J Anxiety Disord. 2002;6(3):321-9. doi:10.1016/S0887-6185(02)00103-2
21. Akbay Oba A, Dülgergil CT, Sönmez IS. Prevalence of dental anxiety in 7- to 11- year-old children and its relationship to dental caries. Med Princ Pract. 2009;18(6):453-7. doi:10.1159/000235894
22. Laki K, Beslot-Neveu A, Wolikow M, Davit-Béal T. [Child dental care: what's about parental presence?] Arch Pediatr 2010;17(11):1617-24. French. doi:10.1016/j.arcped.2010.07.016
23. Williams C, Garland A. A cognitive-behavioural therapy assessment model for use in every clinical practice. Adv Psychiatr Treat. 2002;8(3):172-9. doi:10.1192/apt.8.3.172
24. Aminabadi NA, Sohrabi A, Erfanparast LK, Oskouei SG, Ajami BA. Can birth order affect temperament, anxiety and behavior in 5 to 7-year-old children in the dental setting? J Contemp Dent Pract. 2011;12(4):225-31.
25. Davey GC. Dental phobias and anxieties: evidence for conditioning processes in the acquisition and modulation of a learned fear. Behav Res Ther. 1989;27(1):51-8. doi:10.1016/0005-7967(89)90119-8